The Refrigeration Service Engineer

LIBRARY

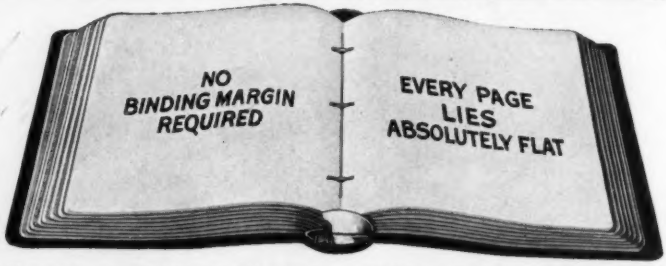
Vol. 2
No. 12

DECEMBER • 1934

Servicing the Welsbach Compressor—Refrigeration Controls—Dehydration of Refrigerator Assemblies—Observation Chart

BIND—your copies of THE REFRIGERATION SERVICE ENGINEER for Future Reference

ALL COPIES ARE PUNCHED TO FIT THIS BINDER



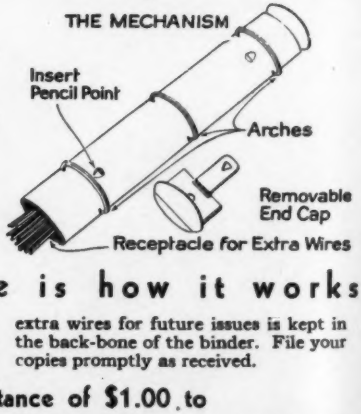
Every issue of this magazine will have valuable information which you will want to retain for future reference.

Here is a handy, substantial binder that permits you to add each copy readily as it is received. The binder is so constructed that regardless of the number of issues, every page lies flat and is easily read.

Holds twelve issues—an entire year's supply. No hunting around for lost or missing issues. The entire year's edition is always handy.

The name of the magazine is attractively stamped on the front cover in gold.

Only $1.00 postpaid



It's simple — here is how it works

Each issue is locked in place with spring wire. It takes only an instant to add an issue. Reserve supply of extra wires for future issues is kept in the back-bone of the binder. File your copies promptly as received.

Send Your Remittance of $1.00 to

THE REFRIGERATION SERVICE ENGINEER

433 NORTH WALLER AVE. CHICAGO, ILL.

The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of
REFRIGERATION UNITS *and* OIL BURNERS

VOL. 2 DECEMBER, 1934 NO. 12

Table of Contents

Subject Index, June, 1933, to December, 1934 1

Servicing the Standard Welsbach Compressor 7

Refrigeration Controls, *by L. B. Miller* 13

Dehydration of Refrigerator Assemblies in the Field, *by F. B. Riley* 21

Extra Profits 24

Good Work 24

Observation Chart 25

Three New R.S.E.S. Chapters Formed 26

R.S.E.S. Chapter News 27

Greetings from the National President 29

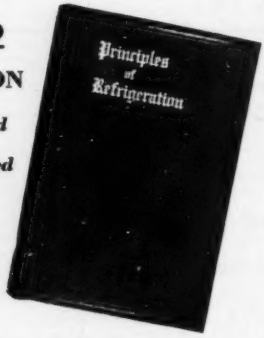
PUBLISHED MONTHLY BY
NICKERSON & COLLINS COMPANY
433-435 NORTH WALLER AVE., CHICAGO, ILL.
EASTERN OFFICE: 149 BROADWAY, NEW YORK CITY
Publishers for 42 years of Technical Books and Trade Journals Serving the Refrigeration Industries.
Subscription: United States $2.00 per year. Single copies 25c. All other countries $3.00 per year.

Copyright, 1934, by Nickerson & Collins Co., Chicago

A Complete Library on Refrigeration
IN ONE VOLUME

PRINCIPLES *of* REFRIGERATION

3RD EDITION
Revised and Enlarged



The work is in everyday language, and as free as possible from higher mathematics. The method of treatment has been to present a comprehensive treatise on the fundamental principles. With a firm grounding of these fundamental principles, the practitioner is enabled to intelligently design or operate refrigerating machinery. The theoretical and fundamental operating principles are given attention first. This is followed by numerous practical considerations and the application of the fundamental principles to the economic production of ice and refrigeration for various purposes.

The author has drawn extensively on his wide experience as a refrigeration engineer and teacher of refrigeration engineering, for materials for this work.

OVER 1000 PAGES
PROFUSELY ILLUSTRATED
CLOTH BINDING $7.50

Published By
NICKERSON & COLLINS CO.
433 N. WALLER AVE. CHICAGO

IDEAL RESURFACERS RECOMMENDED BY THREE LEADING MAKERS

No Disassembly Required

"Not only endorsed and approved, but Highly Recommended by three leading refrigerator makers" . . . conclusive proof of IDEAL Stones' efficiency.

Non-copper collecting, non-conductors. Used without disassembly and with current on, IDEALS mean speed repairing, accurate truing. They're easy to use, cut down high mica, and insure perfect commutation. They're vouched for by over 17,000 Ideal Users—by 18 years of Ideal Dependability.

TWO GRADES RECOMMENDED
COARSE: For removing high mica.
FINISH: For final application.

Only 75c Ea. Order Yours Today!

IDEAL COMMUTATOR DRESSER CO.
1093 Park Avenue Sycamore, Ill.

ANSUL REFRIGERANTS
AVAILABLE EVERYWHERE

No matter where you are located . . . from Seattle, Washington to San Juan, Porto Rico . . . from Montreal, Quebec to Los Angeles, California . . . there is a warehouse near you carrying ample stocks of Ansul Sulphur Dioxide and Ansul Methyl Chloride.

You can be certain, too, that every cylinder you buy has been given an individual analysis guaranteeing the contents to provide complete refrigeration satisfaction. Write today for complete prices and list of warehouse locations.

ANSUL CHEMICAL CO.
MARINETTE - WISCONSIN

The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 2, NO. 12 CHICAGO, DECEMBER, 1934 $2.00 per Annum

Servicing the Standard Welsbach Domestic Refrigerator

The Construction and Operation of the Ethyl Chloride Welsbach Refrigerator. Illustrations of Operating Cycle. Valve Connections. Difficulties Likely to be Encountered and their Remedies.

THE Welsbach domestic refrigerator, using Alcozol as the refrigerant, which is the trade name for ethyl chloride, was manufactured and placed on the market up until a period of three years ago, by the Welsbach Company, Gloucester City, New Jersey. The company is still manufacturing water heaters and other appliances, but has discontinued the manufacture of this refrigerator.

Ethyl chloride, under atmospheric pressure, boils at 54.5°. Operating under a partial vacuum, commonly termed a vacuum when pressures are reduced below normal atmospheric pressure, the ethyl chloride is admitted through an automatic expansion valve into the cooling coils within the freezing unit.

In Fig. 1 is illustrated the general cycle of operation of the compressor. The Welsbach compressor is commonly termed the "storage" or "hold-over" system, meaning that the chilling coils are not exposed directly to the air circulating through the refrigerator. They are immersed in an anti-freezing solution of water and alcohol. It is through the medium of this anti-freezing solution that the heat is absorbed from the circulating air and thus from the boiling ethyl chloride, the heat is absorbed and the refrigerant circulated as the compressor starts its operation.

Servicing the Welsbach is a comparatively simple matter if the service man is thoroughly familiar with the operating cycle, and the component parts of the system.

The Welsbach Compressor

The Welsbach compressor is of the reciprocating type with a horizontal cylinder, double-acting piston actuated by a Scotch yoke drive. The compressor has a large bore and small stroke, operating at low speed. Its piston is cast iron, hollow cored at both ends. At each end the piston carries rings. The piston is a very close fit in the cylinder. It is driven by a cross-head through the center, actuated by an eccentric shaft. The piston cross-head and eccentric are accurately ground to a close fit with highly polished bearing surfaces. The cylinder, oil separator and compressor legs are cast en-bloc.

Instead of being driven by a conventional crank shaft through a connecting rod, the piston in a Welsbach compressor is actuated

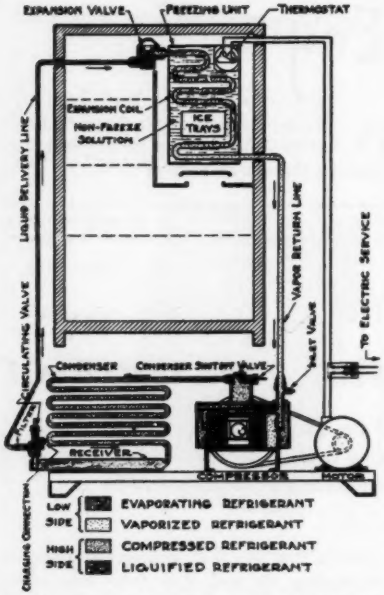


FIG. 1. CYCLE OF WELSBACH OPERATION

by an eccentric shaft. The piston itself is double acting. Thus a single piston in one cylinder is compressing vapor in one end of the cylinder, while the other head of that same piston is on its suction stroke in the other end of the cylinder. There are, therefore, two compression strokes per revolution of the eccentric shaft.

Oil Separator

The oil separator is in the top center of the cylinder casting, of which it is an integral part. It consists of a chamber 2½" high by 2" in diameter. As the compressed vapor is discharged from the cylinder, it enters this chamber through a short ½" brass tube. A special spiral strip inserted in this tube imparts a whirling motion to the vapor as it is expelled into the lubricant separator. The discharge port from the separator to the condenser is protected by an umbrella shaped baffle. The whirling vapor strikes this baffle, and because the vapor is lighter than the mist of lubricant accompanying it, the vapor and lubricant separate, the lubricant dropping back to the bottom of the separator and returning to the compressor, while the vapor passes up through the discharge port and into the condenser coils.

There is one point in the Welsbach system where extra precaution must be exercised to prevent the escape of the refrigerant. This is where the drive shaft enters the compressor. The Welsbach at this point is sealed with a vapor seal. This comprises a copper sylphon encircling the drive shaft to which one end of the bellows is firmly attached and with which it rotates.

Condenser Shut-off Valve

The condenser shut-off valve, located on the top of the lubricant separator on the compressor, controls the flow of Alcozol from the compressor to the condenser. It is fastened to the lubricating oil separator head by means of cap screws. This valve is omitted on later models.

Circulating Valve

A circulating valve is placed at the discharge end of the receiver, controlling the flow of Alcozol between the condensing unit and the freezing unit and also providing a port through which the system may be charged with Alcozol and to which a pressure gauge may be attached for observing and checking operations. The body of this valve screws into the casting on the end of the receiver.

The two valves mentioned above are of a three-way type—that is, there are three openings into the valve body of each. They are so designed and constructed that when the valve stem is turned all the way to the right the opening into the end of the valve is closed. When the stem is closed all the way to the left, the small opening in the top of the valve is closed. The third opening into the valve cannot be closed by turning the valve stem. Figures 2 and 3.

Inlet Valve

A vacuum gauge port valve (called the *"inlet valve"*) is provided at the compressor intake. This makes it possible to attach a vacuum gauge for checking and observing

the conditions prevailing on the low pressure side without disturbing the system. This valve fitting is attached to the left hand

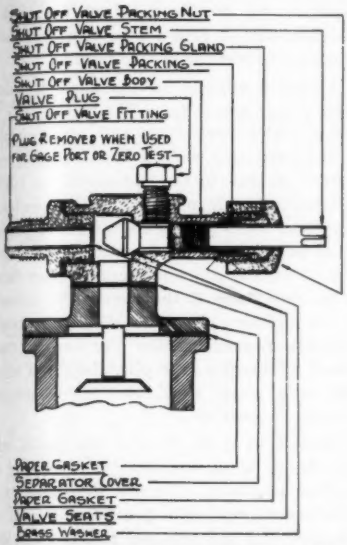


FIG. 2. CONDENSER SHUT OFF VALVE

cylinder head of the compressor and provides a connecting link between the compressor and the tubing through which vapor is drawn from the chilling unit. This valve does not close off the suction line. Figure 4.

Welsbach automatic control, used on standard line boxes, is regulated through a positive acting thermostat. It is part of the motor circuit and is mounted directly on the surface of the freezing unit. When the freezing unit reaches a temperature of approximately 24° F., the motor starts and continues to operate until the temperature of the freezing unit is reduced to approximately 18° F.

The actuating member of the thermostat is a bi-metallic spirally wound coil. In appearance it resembles the mainspring of a clock. The outer end of this coil is mounted rigidly in the thermostat case. To the inner end of the coil is attached a cradle which supports a small glass tube containing mercury which is free to flow from one end to the other. Movement of the mercury covers or uncovers two electrodes, thus making or breaking the electric circuit. To prevent oxidation, the glass tube (which is called a mercury bottle) is filled with an inert gas at low pressure in much the same manner as nitrogen filled electric light bulbs.

The bi-metallic spring possesses the property of winding itself in one direction when

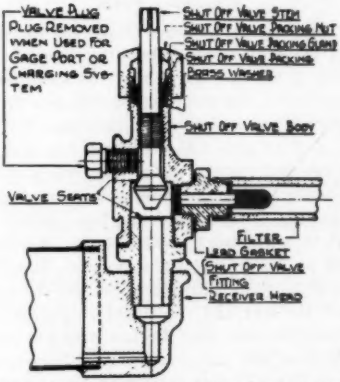


FIG. 3. CIRCULATING VALVE ON RECEIVER

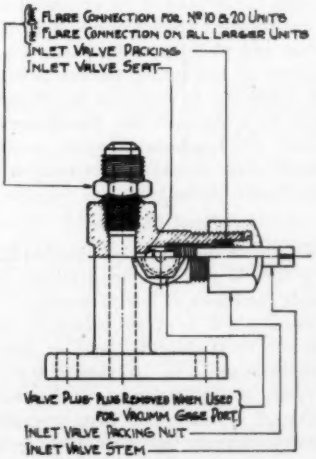

FLARE CONNECTION FOR Nº 10 & 20 UNITS
FLARE CONNECTION ON ALL LARGER UNITS
INLET VALVE PACKING
INLET VALVE SEAT
VALVE PLUG- PLUG REMOVED WHEN USED FOR VACUUM GAGE PORT
INLET VALVE PACKING NUT
INLET VALVE STEM

FIG. 4. INLET VALVE

subjected to a reduction of temperature and in the other direction when subjected to an increase in temperature because of the dissimilar metals from which it is constructed. As the coil contracts, due to a reduction of temperature, the supporting cradle tilts the

glass tube so that the mercury flows away from the contact points and breaks the electric circuit. As the temperature again rises, the coil expands and tilts the tube in the other direction until the mercury flows to the opposite end of the tube and re-establishes the electric circuit.

Expansion Valve

Obviously the pressure of the gas entering this valve is greater than the pressure at which it leaves. There must be some point in the valve, therefore, which acts as a dividing wall between the two pressures. This is the gate or dam which controls the flow of refrigerant. It is a valve port which opens or closes by the movement of a metal ball. A spring tends to hold this ball against its seat, thus keeping the valve closed. A bronze stem passes through the valve port, however, and if the stem is depressed the ball is forced from its seat and the liquid refrigerant is allowed to flow into the low pressure area.

Part of this low pressure area is bounded by a bronze plate attached to a copper sylphon or bellows. This sylphon is soldered gas tight to the head of the expansion valve. The bronze stem which becomes part of this sylphon and plate assembly passes through the plate. A coil spring, tending to lift this stem, tends also to compress the sylphon or bellows to compensate for the atmospheric pressure which otherwise would cause the bellows to expand unduly if a vacuum were drawn inside of the valve.

Ethyl Chloride

Like carbon dioxide, ethyl chloride is perfectly safe in practical application. Ethyl chloride condenses at low pressures.

Alcozol, which, as stated before, is a trade name for ethyl chloride, boils at 54.5° F. atmospheric pressure. In view of this characteristic, its application as a refrigerant is possible at pressures less than atmospheric. Alcozol vapor may be condensed or liquefied at normal room temperatures by a very slight pressure. In fact, under extreme summer conditions a pressure of more than 25 pounds per square inch is seldom developed in the Welsbach system, and in normal application a 20″ vacuum produces the desired temperatures in the freezing unit.

At a summer temperature of 86° F. Alcozol will condense at 13.4 pounds pressure per square inch. This circumstance may be compared with the 52 pounds pressure required to condense sulphur dioxide at the same temperature, 80 pounds required for methyl chloride, and a pressure in excess of 1000 pounds required for carbon dioxide.

Alcozol is slightly inflammable. It burns with a lazy green flame like alcohol. It is not explosive when mixed with air excepting within extremely narrow limits of the proportion of gas to air. Inasmuch as slight inflammability is possible, ***neither matches nor other open flames should be employed when searching for leaks,*** nor should a system be broken down or purged when there is an open flame in the room. The Alcozol in the ordinary domestic Welsbach system presents a much smaller fire hazard than would a 16 ounce (one pint) bottle of alcohol on a closet shelf, or even a smaller amount of gasoline.

Alcozol, as in the case of any liquid, will not change temperature while vaporizing at a given pressure. Nor will the vapor temperature change while liquefying at a given pressure. If the pressure is increased, the temperature increases. At a 21.5″ vacuum, for instance, a mixture of Alcozol liquid and vapor can never be higher than 0° F.

The alcohol and water should be very carefully and thoroughly mixed. This mixing should be done before the solution is added to the tank. Unless they mix thoroughly, not only will you have an uneven frosting on the tank but it is possible that the water will freeze, resulting in unsatisfactory operation and even damage to the system.

Best results are obtained by mixing the water and alcohol in a large can or bucket—either shaking or stirring the mixture.

Place the can or bucket on top of the refrigerator—protecting the finish of the refrigerator. Introduce this solution into the tank through a siphon hose—this siphon consists merely of a piece of rubber tubing of proper length.

When non-freezing solution is put in the tank, space must be allowed for its expansion when it warms up, as occurs on defrosting, and when the machine is out of service and the cabinet in a warm room.

The best procedure to follow is to fill the tank all the way to the filler cap and then siphon out a half pint. The ordinary drinking glass or cup holds about one-half pint.

ALCOZOL TEMPERATURE-PRESSURE RELATIONSHIP

"T" signifies temperature (°F. in expansion coil or at liquid receiver).
"V" signifies inches of mercury below atmospheric pressure (vacuum gauge reading).
"P" signifies pounds per square inch above atmospheric pressure (pressure gauge reading).

T	V	T	P	T	P
	—	54.5	0.0	90	15.4
	—	55	0.3	91	15.9
	—	56	0.6	92	16.5
	—	57	0.9	93	17.0
	—	58	1.2	94	17.6
	"30"	59	1.5	95	18.2
	29	60	1.9	96	18.8
	28	61	2.3	97	19.3
	27	62	2.7	98	19.9
	26	63	3.1	99	20.5
—17.5	25	64	3.6	100	21.0
—12.0	24	65	4.0	101	21.8
— 7.0	23	66	4.5	102	22.3
— 2.0	22	67	4.9	103	22.9
2.5	21	68	5.3	104	23.7
6.5	20	69	5.8	105	24.3
10.6	19	70	6.2	106	24.8
14.3	18	71	6.6	107	25.5
17.7	17	72	7.1	108	26.3
20.8	16	73	7.5	109	26.9
23.7	15	74	7.8	110	27.5
26.4	14	75	8.3	111	28.1
28.9	13	76	8.7	112	28.6
31.3	12	77	9.1	113	29.2
33.6	11	78	9.6	114	29.9
35.8	10	79	10.1	115	31.6
37.9	9	80	10.4	116	32.3
40.0	8	81	10.9	117	33.1
42.0	7	82	11.4	118	33.9
44.0	6	83	11.9	119	34.7
45.9	5	84	12.4	120	35.5
47.8	4	85	12.9	121	36.3
49.6	3	86	13.4	122	37.1
51.3	2	87	13.9	123	37.9
52.9	1	88	14.4	124	38.7
54.5	0.0	89	14.9	125	39.5

Condensing Unit Specifications

Three models of condensing units are used in household systems.

MODEL	BORE	STROKE	RPM	SIZE MOTOR	ICE MELT CAPACITY
10	3	⅝"	300	⅛ H.P.	5#/hr.
20	3	1"	300	¼ H.P.	7#/hr.
25	3	1"	360	¼ H.P.	8½#/hr.

All Standard Line models employ the same size belt. Model 25 differs from Model 20 in motor pulley size and suction line fitting. Model 10 and Model 20 Compressor parts are interchangeable excepting for drive shaft, piston and cylinder.

Model 10 compressor has a ring around the lubricating oil separator chamber making it distinguishable from the Model 20 compressor which is minus this ring.

Brine Mixtures

MODEL NO.	TOTAL CAPACITY OF BRINE TANK *		SPECIAL COMPLETELY DENATURED ALCOHOL		WATER REQUIRED	
	QTS.	PTS.	QTS.	PTS.	QTS.	PTS.
S-206	15	0	6	0	8	1
S-1065	15	0	6	0	8	1
S-108	14	0	5	1	8	0
S-109	16	0	6	1	9	0
S-208	19	0	7	1	11	0
S-209	18	0	7	0	10	1
S-210	15	1	6	0	9	0
S-212	19	1	8	0	11	0
S-214	23	1	9	1	13	1
S-215	21	0	8	1	12	0
S-216	24	1	9	1	14	0
S-220	37	1	14	1	21	1
S-225	42	1	16	0	24	0
S-2530	50	1	19	0	28	0
S-2540	63	0	23	1	34	1

* Total capacity of brine-tank exceeds, slightly, the quantity of brine used. Space is allowed for expansion.

Special. Completely denatured alcohol should be used. Mix alcohol and water thoroughly before filling tank.

Systems Used in Welsbach Cabinets

REFRIGERATOR	SYSTEM (See Above)
C-100	S-206
C-101	S-208
C-200	S-209
C-201	S-215
C-140	S-1065
C-150, C-155, Early C-160	S-109
C-260, C-270	S-210
C-280	S-212
Late C-160, C-170	S-110 Sp * { 6½ Qts. Alcohol; 10½ Qts. Water

* S-110 Special has same dimensions as S-210 but only 2 ice trays.

Electrical Wiring

The two thermostat leads in the Standard line cabinet are attached to a female Wirt connector which is fitted over the two pin connections extending from the thermostat.

The switch box besides containing the switch also acts as a junction box for the motor and thermostat leads. One power line runs from the switch box direct to the motor; the other is connected to one of the thermostat wires and the remaining thermostat wire and motor wire are connected together. These are shown in Figure 5.

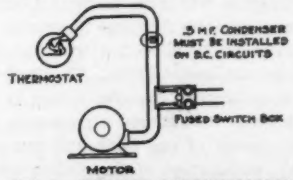


FIG. 5. WIRING CONNECTIONS

The Welsbach Thermostat

The thermostat (Figure 6) is mounted on the thermostat plates of the freezing unit by means of two flanged screws diametrically opposite each other. It is engaged by another screw slotted and shaped in the form of a small gear or pinion which meshes with teeth in what might be called the gear sector of the thermostat case. The thermostat case is marked on its cylindrical surface so that if mounted with this mark in line with the center of the adjusting pinion, it will break the electric circuit when the freezing unit temperature drops to approximately 18° F.

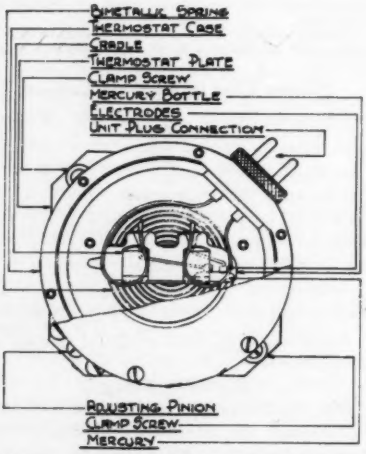


FIG. 6. THE WELSBACH THERMOSTAT

If it is desired to change the temperature setting, the two flanged clamp screws should be loosened and the adjusting pinion turned by means of a screw driver applied to its slotted head. Turning the pinion in a clockwise direction will increase the cut-out temperature, whereas turning the piston in a counter-clockwise direction will occasion a lower cut-out temperature. The thermostat turns in a direction opposite to that in which the pinion is turned, and a movement equal to the spacing of one tooth will change the cut-out temperature of the cooling unit between 3 and 4° F.

If the setting is "too cold," turn off current and allow freezing unit to warm up to 20° F. (To accelerate, open a door slightly for short intervals only and do not allow warm room air to react directly on thermostat.) When brine reaches 20° F., adjust thermostat so that it just breaks electric circuit. Then turn thermostat in opposite direction until circuit is again completed. This will occur at the desired setting. To verify, observe brine temperature at time of cut-out. This should occur at 18° F.

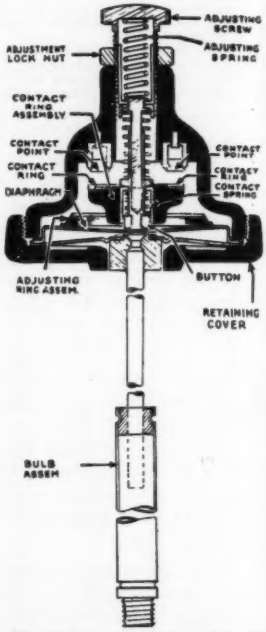


FIG. 7. BISHOP & BABCOCK THERMOSTAT

Bishop and Babcock Thermostat

The bulb of the thermostat (Figure 7), which is connected to the actuating mechanism by means of a flexible copper tube of small diameter, is located within a special sleeve on the freezing unit. When the brine tank warms up, it builds up a pressure in this bulb which, in turn, causes the diaphragm to bulge out, overcoming tension of the contact spring. This brings the contact ring and contact points together, thus completing the circuit and causing the motor to run.

When the brine tank cools down to proper temperature, the pressure drops and the diaphragm snaps back to its former position (the position shown in sketch), breaking the contact and causing the motor to stop.

The actuating mechanism must be located at a distance that makes it possible to have the bulb within the special sleeve of the freezing unit.

In the C-140 cabinet it will be found plugged into a female receptacle on the H & H switch in the machine compartment.

The B & B thermostat is equipped with a male element of a split plug connector, similar to the ordinary Hubble Plug. This male element may be plugged into the female receptacle of any standard electric fitting and wired as for standard Welsbach thermostat.

Adjustment

To adjust temperature control—

(a) Loosen up adjusting lock nut

(b) Turn adjusting screw clockwise to cut out, counter-clockwise to cut in. One turn clockwise will raise temperature setting by approximately 1°. Conversely, one turn counter-clockwise will decrease temperature setting by approximately 1°. There is a temperature differential between cut-in and cut-out points of approximately 7° and no adjustment of this range is possible. In other words, if the cut-in temperature is decreased, the cut-out temperature is decreased by approximately the same amount.

When proper setting is made, tighten adjustment lock nut.

To remove thermostat from a C-140 Cabinet, first remove the bulb from sleeve on tank and draw bulb and tubing through bushing in the back of the cabinet. This can be done without disturbing the ¼" and ⅜" lines.

To be continued in the January, 1935, issue

IN the January issue, the Welsbach Expansion Valve and its service will be given, also the seal and a complete list of possible service calls on this unit and their remedy.

Refrigeration Controls

Domestic and Commercial Controls. Description of Applications. Diagrams of Various Air Conditioning Hook-Ups. Development of Control Systems as Applied to Air Conditioning Installations.

By L. B. MILLER*

THERE are two general classifications of refrigeration controls. First, those controls for domestic refrigeration equipment, and second, those for commercial and industrial types of installations. In breaking these down further, there are two sub-classifications, first, refrigerant controls which have to do with the regulation of the refrigerant, and second, fixture controls, which have to do with the regulation of the temperature in fixtures, these instruments being of either the pressure or temperature type.

Refrigerant Controls. There are three general types of refrigerant controls found in domestic boxes, expansion valves, low side floats and high side floats. In the past two seasons there has been quite a swing to the use of high side floats for reasons that are common knowledge to the industry in general. One or two manufacturers have employed the fixed orifice or a modification of a fixed orifice to care for expansion of the refrigerant on some of their lower priced models. In general the selection of the refrigerant control is a manufacturer's particular problem.

Fixture Controls. Insofar as this type of unit is concerned the temperature control is almost universally used. In the past some manufacturers have employed the low side

* Refrigeration Division, Minneapolis-Honeywell Regulator Co.

pressure control, but this has been gradually eliminated in favor of the temperature type. The conventional temperature control is of the remote bulb type, having the bulb attached to the suction line near the evaporator. The control is provided with six or eight positions of temperature control for raising and lowering the temperature and is almost universally equipped with an overload protection for the motor. In the past two seasons a defrosting mechanism has also been added to the control to furnish the semi-automatic regulation of the defrosting cycle.

Commercial Type

In discussing these controls, it would seem advisable to speak first of the units that are applicable to sulphur dioxide, methyl chloride and F12 in this portion of the discussion and then refer in general to those applicable to ammonia systems later.

Refrigerant Controls. Since flooded systems of the commercial type are being so rapidly replaced by direct expansion systems, this naturally has limited the use of the low side float in commercial installations. The one control that is more responsible for this particular swing of the industry than all others, is the thermostatic expansion valve. This device is rapidly replacing the plain expansion valve, low side and high side floats.

The tremendous improvements that have been made in this control have enhanced the operating efficiency of commercial equipment and the manufacturers who have been directly responsible for the improvement in the unit are certainly to be congratulated on the masterly manner in which they have handled the problem.

The improvements in the design and construction of, as well as the use of suction line check valves, two-temperature snap valves and electrically operated valves their complementary temperature controllers, have greatly improved the operating characteristics of multiple systems used in both the commercial and air conditioning type of application. It is felt that in no small manner are these units responsible for the definite strides that have recently been made in this phase of the industry.

Fixture Controls

Pressure Controls. Pressure controls applied to the low side for the regulation of the condensing equipment, mechanically, still remain conventional. This statement applies to those controls that are used in commercial installations. For controls used on Freon in air conditioning work, it has been necessary to increase the range of operation. It has also been found advisable to widen the differentials under which these controls must work in order to care particularly for the wider limits of suction pressure imposed by Freon when used in connection with this type of installation.

Combination Pressure Controls with High Pressure Cutout. In general these controls, mechanically, remain unchanged. Similar to the simple pressure controls, it has been necessary to widen the differential of the low side element and to change the high pressure cutout element to care for the higher cutout points as well as the wider differentials that are demanded by F12 in air conditioning.

Thermostats, Self-contained Type. In general these controls have not undergone any radical mechanical change. They still employ thermostatic elements of the bi-metal or vapor filled bellows type. Their use is limited principally to large walk-in boxes and cooler rooms. Their low temperature limitation is between 20° to 25° for the reason that at lower temperatures frost will accumulate on the operating parts and render the controls erratic in their operation. The principal advantage for using this type of thermostat in place of the remote type, is first, the problem of control location and second that the control is not affected by ambient temperatures or temperatures surrounding the outside of the cooled space.

Thermostats, Remote Type. No radical mechanical changes of a basic nature have been made in these controls. It is felt safe to say however, that on account of the more drastic requirements demanded in commercial installations, that in general their operating sensitivity has been increased. This classification in general employs a thermal element provided with a vapor tension fill and having a bulb and capillary tubing that permits

the regulation of temperatures in all general types of commercial application. On account of the fundamental design of these controls, they are all subject to the difficulty of fluctuating ambient or room temperatures. If the temperature surrounding the control case is lower than the temperature to be controlled, the point of control is shifted to the bellows attached to the control case and the operating differential of the control is definitely disturbed. In connection with this class of instrument it is important to bear in mind that the cold point always controls and if there is any possibility of the temperature surrounding the control case becoming lower than the temperature of the control bulb, it is necessary to employ a control provided with the large or ambient type of bulb which compensates for this condition.

Thermostats, Remote Type with High Pressure Cutout. In these controls also, no radical mechanical changes have been made. There seems to be an increasing demand for this device in connection with self-contained unit coolers. Since Freon is used almost universally in this class of equipment, it is necessary to employ the high pressure cutout applicable to F12 service.

High Pressure Cutouts. In the past two seasons there has been considerable refinement in the construction of high pressure cutouts only. The controls are more compact and their appearance has been greatly improved. In the past, the demand for high pressure cutouts has been mostly for use in connection with ammonia equipment. However, with the extensive use of Freon, particularly in Air Conditioning installations, the picture has changed considerably and the demand for this class of control has been definitely increased.

Humidity Controls. Tremendous strides have been made in the design and development of this class of controls. This has resulted in instruments that are more sensitive, more accurate and more stable in their operating characteristics. The use of human hair as a hygroscopic element appears to have given the best results. It seems to be the least affected by air contamination, to be more stable in its operation, and if contaminated by grease and dirt, may be readily returned to correct calibration by proper cleansing. There appears to be a definite trend towards the use of humidity controls in commercial refrigeration installations. This is particularly important in connection with the so-called unit coolers, and it is felt that the use of such control in connection with commercial refrigeration will find a much more general use in the future.

Electrical Refinement. All of the controls described above are of the electrical type in that they incorporate an electrical switching means for controlling their complementary equipment. In the past few seasons drastic improvements have been made in switch actuating mechanism as well as refinement in the design of magnetic detent arrangement, which have greatly enhanced the electrical capacity and life of the so-called open contact type of switches.

Extensive improvements have also been made in mercury switches. Insofar as our own company is concerned, six major refinements have been made, which to our knowledge, are exclusive with us. 1. Refinement of mercury. A chemical process of mercury refinement has been developed which assures the elimination of the lighter base metals and eliminates the possibility of contamination of the mercury in switch operation from the oxides of these elements.

2. Gas purification. By an exclusive process the water vapor present in the hydrogler gas has been eliminated and thereby has materially reduced the possibility of oxidation taking place under the action of the electric arc in switch operation.

3. An exclusion process of electrode cleaning has been developed which eliminates all of the oxides from the switch electrodes and prevents contamination by oxygen which would be liberated under the influence of the electric arc.

4. Design changes of the glass envelope has provided for larger lead-in or seal wires which have increased the electrical capacity of the switches.

5. Improvements in the design and materials used in the ceramics employed in the mercury-to-mercury type of switch has not only enhanced the electrical capacity, but

(Continued on page 18)

Proved and approved by world-wide field experience

You can get immediate delivery

FEDDERS *Model* 33 THERMOSTATIC EXPANSION VALV

ORDER FROM YOUR NEAREST SUPPLIER

BUFFALO, N. Y.
Fedders Manufacturing Co.

BIRMINGHAM, ALA.
Haralson Sales, Inc.

BOSTON, (CAMBRIDGE) MASS.
Melchior, Armstrong, Dessau Co.

CHICAGO, ILL.
Fedders Manufacturing Co.
Harry Alter Supply Co.
B-Line Parts Co.
Geo. Monjian Co.
Carl John Stein Co.

CINCINNATI, OHIO
Fedders Manufacturing Co.
Merkel Brothers Co.

CLEVELAND, OHIO
Debes & Company

DALLAS, TEXAS
Fedders Manufacturing Co.

DENVER, COLO.
Auto Equipment Company

DETROIT, MICH.
W. C. DuComb Company

FERNWOOD, MISS.
Enochs Sales Company

GREENSBORO, N. C.
Home Appliance Service Co.

HOUSTON, TEXAS
Walter Refrigeration Supply Co.
D. C. Lingo Company

KANSAS CITY, MO.
Natkin & Company

LOS ANGELES, CALIF.
Franklin G. Slagel

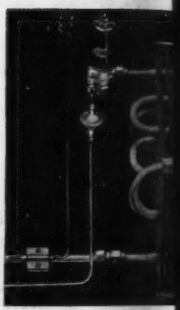
NEW ORLEANS, LA.
Enoch Sales Co.

NEW YORK CITY
Melchior, Armstrong, Dessau Co.

PHILADELPHIA, PA.
Melchior, Armstrong, Dessau Co.

PITTSBURGH, PA.
William M. Orr Co.

ST. LOUIS, MO.
The Spangler Company



FEDDERS AUTOMATIC EXPANSION VALVE

EDDERS MANUFACTURING CO.
7 Tonawanda St., Buffalo, N. Y.
would like to receive a copy of the FEDDERS NEWS containing useful information and ews about electric refrigeration problems.

lame .....

oncern .....

treet ..... City .....

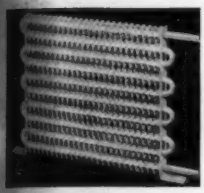
NOW FEDDERS STANDARD

LOWSIDE APPLIANCES

Have Won Their Approval by Deserving it

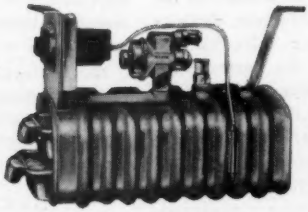
THERE is no such thing as "good enough" with Fedders engineers. The quality that goes into a product is responsible for the performance you get out of it. Installation and service engineers have found that Fedders electric refrigeration appliances safeguard their workmanship . . . their reputation . . . their profits. They have won their approval by deserving it.

The Most Complete Line of Low Side Units in the Refrigeration Industry



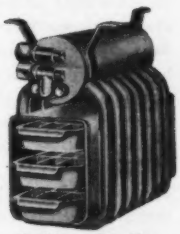
Fedders Continuous Tube Condensers

Eliminate dozens of soldered joints. Made in a complete line of standard sizes.



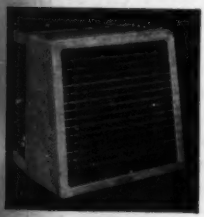
Fedders Prestalloy Evaporators

For dry expansion systems. All-copper and brass construction. 2, 3 & 4 tray sizes.



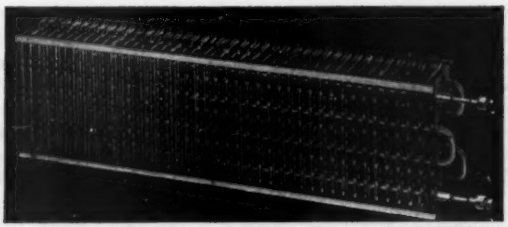
Fedders Cooling Units

Flooded tube-type. Made in 2 to 16 tray sizes.



Fedders Forcedraft Unit Coolers

Maintain correct relative humidity as well as uniform refrigeration. 1/10 to 1½ ton sizes.



Pat. 1,869,174

Fedders Non-Frost Commercial Evaporators

Flat and fluted fins in sizes to fit every job. All copper construction with fins electrically fused to tubes giving Metal-to-Metal Bond. Write for Bulletin 40B.

Also a complete line of Ice Cube Makers, Beer Cooling Coils, Fast Freezing Evaporators, Filters, Dehydrators, etc.

FEDDERS

MANUFACTURING COMPANY

57 Tonawanda Street — Buffalo, N. Y.

REFRIGERATION CONTROLS

(Continued from page 15)

also stabilized the mechanical angle of switch operation after it is placed in use.

6. The design of more flexible leads has increased the electric capacity of the switches without increasing the minimum differentials under which the switches are called upon to operate.

Mechanical Refinements. Most controls are now provided with a simple locking mechanism which permits locking the adjustment and prevents tampering by unauthorized persons. Some manufacturers are also furnishing their controls with visible scales which have proved to be a decided boon to service and installation men.

Water Regulating Valves. A great deal of refinement in design of these controls including packless stem construction, elimination of friction and better valve balance have materially enhanced the performance characteristics of these devices. They have almost entirely eliminated the use of electrical valves for this class of service in view of the enhancement of operating efficiency of the condensing unit when the pressure operated water regulating valves are employed.

Electric Refrigerant Valves. Up to the present time electric valves for use in either liquid or suction line work, have been of the Solenoid type. Decided improvements in construction of these controls have been made and they are quite generally used in multiple systems of both the commercial and air conditioning type. In Air Conditioning work their application is almost entirely limited to liquid line service on account of the fact that the suction pressure is common to all units in the installation.

Ammonia Controls

The use of ammonia as a refrigerant for small commercial applications is being rapidly replaced with methyl chloride, sulphur dioxide and F12. Its use is found principally in large industrial installations where large refrigeration capacity is demanded.

Refrigerant Controls. These usually consist of low side and high side floats, plain and thermostatic type expansion valves. Gradual refinement has been accomplished in all of these controls. Definite improvements have been made in thermostatic expansion valves for ammonia application, and similar to these units for other refrigerants there is a definite swing towards their use both in single and multiple installations.

Fixture Controls. Up to the last two seasons, regulation of ammonia equipment has been, in the main, by temperature control. The thermostat, either of the self-contained or remote type, has been conventional and the high pressure cutout used as a safety device for the machine, has always been employed. Recently refinements in the design of the high pressure cutout have been made along the lines outlined in the case of similar controls for the other refrigerant. There has been some swing lately toward the low side pressure control of ammonia systems, particularly of the multiple type, and refinements of these instruments have also been made.

Water Regulating Valves. Similar refinements for these controls applied to ammonia equipment have been made with the results obtained similar to those with other refrigerants.

Air Conditioning Controls

In approaching the subject of air conditioning controls it is obvious that the problem is so broad that at the best only an extremely sketchy discussion can be given. However, we have chosen to describe very briefly our Modutrol System as it applies to air conditioning and to stress in particular the "effective temperature control" system which we have developed. In approaching the discussion it seems advisable to briefly describe the two general types of control systems that have been in the past or are being used at the present for the manipulation of dampers, mixing valves and other equipment found in air conditioning system.

In describing these systems, on account of lack of space, we shall confine our discussion to electrical equipment. At the same time we should like to point out that most of the results obtained from electrical devices may also be had with pneumatic controls. One exception is the "effective temperature control." To our knowledge, this control system is not available by pneumatic control,

and as far as we know, it is unique with the proportioning or modulating control obtained by our Modutrol system.

Two-Position Control. In air conditioning systems, particularly of the so-called central fan or plenum chamber type, motors are required for the manipulation of dampers of all types as well as valves of all character. Controllers of the room or duct type are necessary to regulate the operation of these motors, their arrangement and electrical hookup being dependent entirely upon the design of the system. The original type of motors were the "two-position" or "on-and-off" type. The controllers were of the single pole, single throw or single pole double throw type. Whenever the controllers call for operation of the motors, the dampers or valves are moved from a full closed to a full open position or vice versa depending upon the demand of the controller. When used as operating control systems, even though ultrasensitive controllers are employed, fluctuations or variations in final results are present. The regulation obtained is a definite improvement over manual control, but is quite ragged as compared with that obtainable from more recent systems.

Figure 1 shows a schematic diagram of a two position system. Assuming the controller to be of the temperature type, when there is a fall in temperature the contact is made and the motor which operates the damper or valve moves to full open position. When sufficient heat is supplied to satisfy the controller, the contact is broken and the motor moves the damper or valve to its full closed position, shutting down the source of heat. Obviously, the same control action may be applied to cooling means as well as heating means. In such action it is apparent that if wide fluctuations of resultant temperatures are to be eliminated, it is imperative that the controllers be as sensitive as possible and the motors as speedy as consistent with good design, in order to reduce temperature fluctuations to a minimum.

Results from this type of control were, at best, just reasonably satisfactory, and it was natural to supplant this system with a more refined development. It should be borne in mind however, that two position control is still employed in certain applications but is used as a so-called limit or safety system. Its principal application is found in the control of preheat coils and fresh air dampers.

Floating Control

This system employs controllers of the single pole double throw variety, with motors of the reversing type, or two motors geared to the same shaft and so connected electrically to run in opposite directions. Ordinarily, in air conditioning work, the motors are geared down so that the speed with which valves or dampers are operated is very slow. This lengthy time cycle is intended to correspond in general, with the slow changes of load conditions or rates of temperature change.

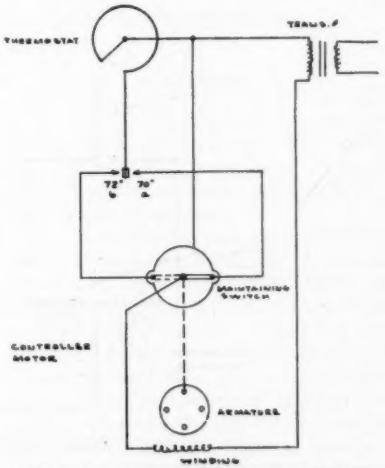


FIG. 1. TWO POSITION CONTROL

Figure 2 shows a schematic diagram of a so-called floating system. It is understood in explaining the system, that the controller may be set for any reasonable differential down perhaps to ½° but for purposes of illustration we shall assume a 2° differential. Therefore the contact "A" will be made at 70° and the contact "B" will be made at 72°.

When the temperature drops to 70° contact "A" is made. This causes Motor "Y" to operate in the direction shown and to open a damper to admit heat. As the temperature rises above 70° contact "A" is

broken and motor "Y" stops leaving the damper in this position. The carry-over in heat which may result will cause the temperature to increase to 72° when contact "B" is made and motor "X" reverses the motion to close the damper and shut off the heat. With the drop in temperature to a value below 72° "B" is broken and the motor "X" stops. It will be observed that this may or may not be the full closed position of the damper. When the temperature drops to 70° contact "A" is made again, motor "Y" opens the damper and the cycle repeats itself.

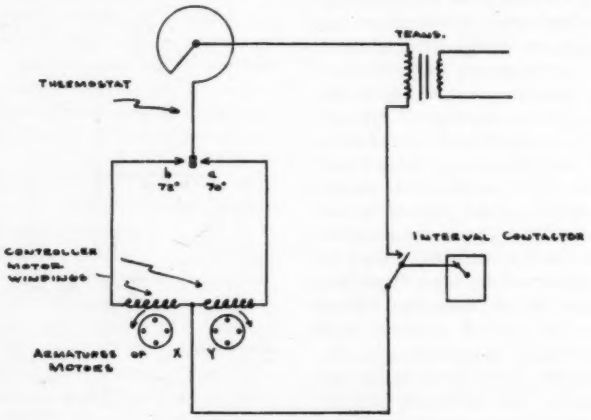


FIG. 2. FLOATING CONTROL

Assuming that the system is well balanced, it is evident that if the rate of change of temperature in the space is identical to the motor speed and the heat capacity of the control will level off and regulate between the limits of the controller giving a more accurate temperature regulation than is obtainable by the two-position means described in the preceding. However, if fluctuation in load conditions take place, they will cause a variation in the rate of temperature change. Therefore, in order to balance out the control, the rate at which the heat is applied must be the same as the rate of the heat loss. With all other factors being constant, this naturally demands a change in motor speed. It will be seen then, that in systems where the load variation is slight and the rate of temperature regulation are obtainable in some equipment means are provided for adjusting motor speed in order to balance it with the variable conditions in different systems. Very satisfactory results are obtained.

It is apparent that most industrial process applications present an entirely different problem. Here the equipment is designed with sufficient capacity to care for any rapid change in load conditions and therefore the controls must be able to cope with these requirements. Such conditions usually demand fast motors and controllers with close operating differentials. In addition to this a form of timing mechanism, usually of the electric clock type, is often provided in the circuit as illustrated at "T." This will make contact at definite intervals and afford a means of compensating for the changes in load conditions. As load changes increase in magnitude, the "on" periods of the timers are lengthened, and as the load changes decrease in magnitude, the "on" periods are shortened.

It is obvious that this class of control is much more expensive than can be employed in the usual type of air conditioning systems for comfort and therefore is limited to the so-called industrial applications in which the cost will permit such refinement.

This article will be concluded in the January, 1935, issue.

Dehydration of Refrigerator Assemblies in the Field

Problem of Dehydration Is One of the Most Important Considerations to Service Men. Some Suggestions Given for Drying Systems.

By F. B. RILEY

DEHYDRATION of Refrigerator Assemblies in the Field is one in which every manufacturer, contractor or service engineer should be interested, as moisture or water in the system is one of the most insidiously destructive agents with which the refrigerating engineer has to contend.

There is practically no technical data available on the subject except for scattered papers which treat chiefly with the necessity for dehydration of parts of the refrigeration assemblies before the installation.

As a matter of fact, there has not been in very recent years any great difficulty experienced due to moisture in the small domestic or household units which are assembled completely dehydrated at the factory and shipped out as a complete unit. However, the difficulty with moisture in the field arises from the fact that it is practically impossible to completely dehydrate the various assemblies entering into the completed unit by the usual process of baking and passing of dehydrated air through the tubing and various parts of the system.

We refer first—to erecting problems and dehydration, and second—to servicing problems and dehydration.

With the two divisions above mentioned there is a further segregation of troubles due to the different refrigerants commonly used in these small commercial installations up to 10 or 15 tons, viz., sulphur dioxide, methyl chloride and Freon (F-12).

Sulphur dioxide is passing rapidly out of the picture as a commercial refrigerant in the small commercial installations which are erected on the premises of the user, although in service work on the older small installations there is a problem of breaking the lines and the possibility of admitting moisture to the system during the servicing operation. Moisture in this type of system usually results in the formation of sulphurous acid with the metal parts being "stuck up" with a gummy substance and usually in a "shut down" of the plant.

Methyl chloride has been the cause of frequent servicing operations due to moisture admitted to the system either during the erecting operation or by oils which have not been sufficiently dehydrated and less frequently by methyl chloride itself, which, until a comparatively short time ago, contained approximately 8 grams of moisture per pound. Analysis of methyl chloride samples now disclose that the standard article is commercially free from moisture and in a usable condition.

Freon (F-12) has presented some difficulties in the field due to other causes than moisture. However, moisture itself apparently causes no serious reaction and the principal difficulty is due to freeze-up in metering valves, or if moisture is in sufficient quantities it may even plug the suction line tube.

In preparing this paper I have written to producers of the above named refrigerants in addition to several of the larger and better known chemical plants where I assumed that work had been done along the lines of this write-up. However, with one or two exceptions the information from manufacturers of refrigerants has been very meager and they seem to prefer to leave it entirely up to the manufacturers of refrigerating machines as to the best dehydrants to use in the field. My excursions amongst the manufacturers in search of information has yielded nothing which might be called authoritative in this matter. Some preferring one of the dehydrants and some another,

* Paper Presented at R. S. E. S. Convention.

even with the same refrigerant. Therefore, I will only attempt to give what is apparently a digest of the best information which seems to be available at this time, leaving out entirely dehydrating methods in the factory and dealing only with those units which are assembled on the premises of the user and secondly—dehydration of units after servicing operations.

Taking the refrigerants in order: It has been customary to use dehydrators which consist usually of a brass or iron tube with suitable capped ends in which S.A.E. fittings have been inserted and filled with flake anhydrous calcium chloride, containing approximately 95 to 96% calcium chloride (CaC12). Where the calcium chloride is not left in the refrigerant line too long, or until disintegration sets in, this plan works out very satisfactorily for taking out a small amount of moisture. It must be clearly understood that when calcium chloride is saturated to the limits of its capacity the absorbed moisture will cause the calcium to disintegrate and finally the divided particles, which resemble extremely fine, moist sand, will find their way into the system and cause as much trouble as the moisture itself would have caused to begin with. Proper filtering means must be used with calcium chloride to keep the calcium dust from passing into the system. Calcium chloride should not be permitted to use up more water than is necessary for the formation of the monohydrate. This would give it a theoretical absorbing capacity equal to about 16.2% by weight of the calcium chloride charge. Calcium chloride does not tend to neutralize any acid, if present, in the system.

Sodium Calcium Chloride

One or two manufacturers have offered the use of sodium calcium chloride for the reason that this dehydrating agent neutralizes any slight acidity in the sulphur system. However, if acid is present in sufficient quantities this dehydrant would not relieve a dangerous condition.

Calcium oxide (CAO) appears to be a very satisfactory dehydrant, always, of course, with a suitable filter of asbestos wool, wool felt or other wool material, in order to prevent passage of dust through the system. The drying action of the calcium oxide depends on the formation of calcium hydro-oxide and this dehydrant has a theoretical water absorption of about 32% by weight. As a matter of fact, some manufacturers have stated that they were not particularly adverse to having some of the calcium oxide go through into the system as it would seem to be a fair lubricant. However, this would not seem to be the usual practice and is not recommended as a lubricant.

Activated alumina has been used in sulphur systems, apparently with considerable success. Activated alumina does not absorb as much moisture as does the calcium oxide, but neither does it disintegrate in the system and on the whole seems to be a very satisfactory dehydrant, but it should not in any event be reactivated and used again.

Methyl Chloride

Methyl chloride presents problems which are more difficult than with Freon. We assume that there will be no very large sulphur dioxide systems erected in the field so will dismiss sulphur from discussion here. Moisture in the methyl chloride system forms a mild hydrochloric acid, although the action, according to the best authorities, is electrochemical in its nature, whereby metal replaces hydrogen ions in solution, the transfer being attended by a flow of current. Rapid circulation and concentration of the acid increases the rate of solubility of metals. In the methyl chloride systems acid resisting metals, especially in the needles and seats, are very helpful but are only a temporary relief and are not a cure for this insidious, destructive corrosion, especially in the needle and seats. Further difficulty has been experienced in the copper plating of the steel parts in which the copper has flaked off and becomes lodged in the suction and discharge valve seats.

The apparent cure for the conditions enumerated here is to place an efficient dehydrator in the liquid line and one which will remove the moisture before there is an opportunity for hydrochloric acid to form. It is probably true that more expansion valves or other metering valves have been ruined by the failure to place these dehydra-

tors in the line than all other destructive conditions combined.

All the dehydrants, such as calcium chloride, calcium oxide and activated alumina have been used efficiently but the danger lies in not knowing just how much moisture there is in the system or in having a dehydrator with insufficient material in it to take care of the total amount of moisture present.

Calcium oxide has been used very effectively and is low in cost and can easily be replaced, especially in the serviceman's dehydrator. It should never be reactivated and a thoroughly dry calcium oxide should always be placed in the dehydrator. In the larger systems it would be well to install a sufficiently large dehydrator in the liquid line, permitting it to remain in place for a week or ten days before removing it, to be sure that all moisture is entirely absorbed by the dehydrator. The only apparent preference for the calcium oxide over activated alumina is in the fact that it has greater absorbing qualities and a much lower cost.

Activated Alumina

Activated alumina apparently has no disadvantages except cost and its lower absorption possibilities. It has, however, one great advantage in that it does not disintegrate in the system. The activated alumina should not be reactivated due to the fact that the pores in this material may become clogged with oil or other matter so that it cannot always be reactivated properly. It is unwise to leave any of the dehydrants in the system after they have reached the limit of their capacity for absorbing water.

Dehydrated methyl alcohol up to 5% by volume has been placed in methyl chloride and Freon systems with the thought of forming a non-freeze mixture. This works out satisfactorily, according to some authorities. However, it does not prevent the formation of hydrochloric acid in the methyl chloride system and with the proper dehydrators the necessity for using an anti-freeze solution is eliminated.

Freon (F-12) seems to be the least troublesome of the refrigerants from the standpoint of moisture, as there is no apparent chemical reaction due to moisture and the only result is a freeze-up in the metering valves. Rather than to put alcohol in the system to prevent a freeze-up it is best to use a dehydrator using either calcium oxide or activated alumina, or possibly some of the other dehydrants not quite so well known, in the liquid line. These dehydrators will remove moisture, and as before stated, they should be removed from the system after being certain that all moisture has been absorbed or adsorbed.

The net result of our investigation seems to point conclusively to the advisability of placing an efficient dehydrator in any unit which is erected in the field and also after all servicing operations where there is the slightest possibility for moisture entering the system. One suggestion should not be overlooked and that is the advisability of placing a dehydrator of sufficient capacity to remove all traces of moisture in the system and to change the dehydrant after each servicing or erecting operation and replace the chemical used with a fresh lot so that there will be no question as to its condition when placed on a new erecting or servicing job.

Zinc Moss

In passing it is well to state that zinc moss, when used in the ordinary dehydrator in place of calcium chloride, calcium oxide or activated alumina, will prevent the formation of sulphurous acid in a sulphur dioxide system or will neutralize the acid if it has formed, but it has no value due to a non-condensible gas which will be formed by the action of the sulphurous acid on the zinc moss but this can easily be purged out through the pressure discharge valve or at a high point in the condenser. No definite time can be stated in advance as to the actual time required to dehydrate a system. It depends somewhat upon the condition of the dehydrating agent when placed in the system, as oil may retard the absorbing rate very materially and where one system with considerable moisture may be thoroughly dehydrated in two or three days' time, we find that other systems will still contain some moisture after two or three weeks, even with an efficient dehydrator properly installed on the refrigerant line. Good practice indicates that an oversize dehydrator is safest.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 2 December, 1934 No. 12

RATES OF SUBSCRIPTION
In Advance, Postage Paid
UNITED STATES - - - - - - - - - $2.00 a year
ALL OTHER COUNTRIES - - - - - $3.00 a year
Single copies, 25 cents

Advertising rates on application. Make remittances by postoffice or express money orders, international money orders, checks or drafts on Chicago or New York, payable to Nickerson & Collins Co., Publishers.

NICKERSON & COLLINS CO., *Publishers*
General Office.....433 N. Waller Ave., Chicago
Telephone Austin 1303, 1304 and 1305
Eastern Office.....149 Broadway, New York City
Telephone Barclay 7-8275

Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

EXTRA PROFITS

A SERVICE call gives the service man a most desirable entrée into the home and an opportunity of securing extra profits by a suggestion to the housewife of the desirability of certain conveniences which will add to the efficiency of her refrigerator.

As has often been repeated in these columns, a successful service man is a combination of many desirable qualities and among other things salesmanship assumes a high standing in the list.

The very approach of a service man to the customer is a definite part of this salesmanship and after the customer is sold on the desirability or superiority of your service, the possibilities of extra profits are dependent upon the service man's salesmanship in suggesting the use of other accessories for the refrigerator as, for example, new ice cube trays, a food compartment thermometer, regasketing of refrigerator doors, or other similar items which afford a margin of profit in their sale and which ultimately amount to a fair dividend in extra profits with very little extra selling effort required.

A service man has a first-hand knowledge of the refrigerator that he is working on and with a little suggestion can secure extra profits from many a service call.

GOOD WORK

INDEPENDENT servicing has made rapid strides. Its future growth and recognition will be judged by its performance and the service it renders. It has unquestionably established itself as a definite part of the refrigeration business.

Independent servicing in many localities has accomplished definite results for a large number of manufacturers and distributors. Smaller manufacturers without extensive service facilities have been in a position to extend their sales nationally because of the service that independent organizations have been able to extend.

Thousands of owners of domestic and commercial equipment have saved a considerable portion of their original investment in "orphan" machines through the facilities of the independent service organization.

The independent is truly independent in the sense that without any connection or preference for any individual machine his first concern is to place the job which he has been called upon in the best operating condition. It is his duty to satisfy the customer that his or her selection of refrigerating equipment has been right and in this connection the independent is an important factor to the manufacturer in building good will for his equipment. Such should always be the policy of the independent.

It is not to be denied that frequently manufacturers' replacement parts have fallen into the hands of those who are not qualified in knowledge or the installation of such parts and, consequently, another inefficient job has been recorded with its ultimate reflection on the manufacturer.

However, it is safe to assume that such service dooms its own existence and with the business of refrigeration servicing attracting a more experienced and better qualified service man—a more responsible organization in the community whose business depends entirely upon its efficient service, it can be expected that a true recognition of the definite place and service which the independents occupy as regards their relations with the manufacturer should not be in the too distant future.

OBSERVATION CHART

Revised December, 1934

START SYSTEM OPERATING AND MAKE OBSERVATIONS IN ORDER 1 TO 10 → Overhaul Inefficient Compressor Before Removing Restriction, If Any and Remove Restriction Before Charging.			1	2	3	4	5	6	7	8	9	10
						Compressor						
			Frost	Refrigeration Temperature	Feel Liquid Line	Feel Top	Jumpy?	Orifice Noise	Cycle	Head Pressure	Back Pressure	Test Comp.
CIRCULATING TROUBLES — MAJOR	11	INEFFICIENT COMPRESSOR CAUSED BY: (A) Bad Compressor Discharge or Suction Valve (B) Bad Piston Rings—2 cyl. Split Gasket (C) Not Pumping Enough Gas or Too Slow Speed =	Slight or None	Bad	Cooler	Cooler	Normal	Gurgle	Long On Short Off	Lower	High On Off Cycle	
	12	ORIFICE TOO SMALL CAUSED BY: (A) Stuck Shut Needle or Restriction (B) Closed Receiver Valve (C) Plugged Liquid Line or Strainer (Dirt, Ice) (D) Restricted Suction (E) Rate of Flow Too Small =	Slight or None	Bad	Normal	Cooler	Normal	Quiet or Gurgle	Short With Pressure Switch — Long On With Thermostat Switch	Lower With — Higher Without Receiver	Lower With — Higher Without Receiver	
	13	UNDERCHARGE CAUSED BY: (A) Leaky Seal (B) Leaky Joint (C) Careless in Charging =	Slight or None	Bad	Warm	Cooler	Normal	Hissing	Long On—But With Pressure Control High Pressure Float—Short	Lower	Lower Except Low Side Float Higher	
CIRCULATING TROUBLES — MINOR	14	AIR IN SYSTEM CAUSED BY: (A) Leaky Low Side or Seal (B) Neglect in Purging =	Normal With Full Charge	Normal Unless Great Excess	Warm	Hot	Yes	Gurgle	Long On Short Off	Higher	Normal or Higher	
	15	ORIFICE TOO LARGE CAUSED BY: (A) Needle Too Far Off Seat (B) Rate of Flow Excessive =	Suction Line May Frost Up*	Poor	Warm	Hot	Yes	Gurgle	Continuous Or Long On	Higher	Higher	
	16	OVERCHARGE CAUSED BY: (A) Careless in Charging =	Normal	Normal Unless Great Excess	Warm	Hot	Very	Gurgle	Longer On Shorter Off	Higher	Normal or Higher	
CONTROL TROUBLES	17	UNIT RUNS TOO LONG TIME: (A) Switch Set Too Low Cut-Out (B) Thermostat Bulb Too Warm =	More	Very Cold	Normal or Cool	Normal or Warm	Normal	Gurgle	Continuous or Very Long	Normal	Normal or Lower	
	18	UNIT DOES NOT RUN LONG ENOUGH: (A) Switch Set Too High Cut-Out (B) Thermostat Bulb Too Cool =	Slight Frost	Poor	Normal or Cool	Normal or Warm	Normal	Gurgle	Short On Short Off	Normal	Normal	
NO TROUBLE	19	EFFICIENT COMPRESSOR- Pump Sufficient Gas CORRECT LIQUID SUPPLY- Orifice Properly Adjusted CORRECT GAS CHARGE & PERCENTAGE OIL—NO AIR =	All Over	See Chart 13	Cool	Normal or Hot	Normal	Gurgle	Normal	See Chart Sept. 1933	See Chart 13	

Test Suction Power of Compressor by Full Closing of Suction. Compressor Running Should Stop Almost Instantly and Hold for a Few Minutes After Shut Down.

Copyrighted—Herkimer Institute, 1819 Broadway, N. Y.

*Note—Overcharged high side float or capillary tube gives frost back on suction.

16

Cut out along outer line and insert in binder for ready reference.

FOR LEATHER BINDER WRITE TO H. T. McDERMOTT, SECRETARY REFRIGERATION SERVICE ENGINEERS' SOCIETY, 433 N. WALLER AVE., CHICAGO, ILL.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Three New Chapters Petition National Society for Charters

DURING the past month organization meetings have been held in Akron, Youngstown and Cleveland, Ohio, to consider the formation of local chapters under the jurisdiction of the Refrigeration Service Engineers' Society. Enthusiastic groups representing the active service men in each locality participated in these meetings, and National Secretary H. T. McDermott met informally with the various groups and explained the purposes and objects for which the Society is formed, and the program that has been outlined for the coming year in furthering the educational advancement of its members.

On November 14 a group of service men met in Akron and after due consideration of the advantages of associated effort through a local chapter of the R.S.E.S., Akron Chapter was formed with temporary officers and applied for charter for a local chapter.

On November 15 the Youngstown service men petitioned the National Society for a charter for Youngstown Chapter, and the following evening, November 16, Cleveland, with a representative attendance of service men in the Cleveland territory which had previously held several group meetings, unanimously adopted a resolution for the formation of Cleveland Chapter. The National Society after due consideration of these applications has granted the charters to these towns, and charter presentations will be announced at a later date.

AKRON CHAPTER

Meeting of November 14

PURSUANT to a call for a meeting of service men in Akron and vicinity to consider the formation of a local chapter of the Refrigeration Service Engineers' Society, a meeting was held on November 14. Mr. Claude L. Wall was elected to serve as temporary chairman of the meeting and Mr. Chas. Hall as temporary secretary.

The purpose of the meeting was then briefly stated and National Secretary H. T. McDermott was introduced and gave complete details regarding the formation of the Society, its purposes and objects, after which the resolution was introduced that those present should participate in the formation of a local Akron chapter and that a petition for charter be forwarded immediately to the National Society.

A tentative Constitution and By-Laws for the guidance of the local chapter was adopted and it was further moved that Mr. Wall serve as temporary president and Mr. Hall as temporary secretary until the formal election of officers after the granting of the charter by the National Body. After an interesting discussion by the members on various subjects, the meeting adjourned.

✕ ✕ ✕

YOUNGSTOWN CHAPTER

Meeting of November 15

THE first meeting of the Refrigeration Service Engineers' Society was held Thursday night in the show room of E. W. Van Cise, 2600 Market St., Youngstown, Ohio.

The meeting was called to order by Mr. McDermott, National Secretary, who stated the purpose of this Society. Various questions were brought up in the meeting pertaining to service work and how the Society would help each service man. After a discussion by those present the following resolution was proposed, seconded and unanimously adopted:

WHEREAS: It is the consensus of opinion of those present that it is desirable to organize a cooperative society for the purpose of further education and elevation of men engaged in the business of installing and servicing domestic and small commercial equipment, and for social intercourse, now therefore be it

Resolved, That we immediately proceed to form and organize a local chapter of the Refrigeration Service Engineers' Society by the adoption of a Constitution and By-Laws, in conformity with that of the National body, and that we further proceed to elect temporary officers and make formal application to the Refrigeration Service Engineers' Society for charter for a local Chapter.

Mr. Martin Bokesch made a motion to accept the proposed Constitution and By-Laws and E. J. McManus seconded the motion, which carried unanimously.

The following were elected as temporary officers: Kalmer Saunders, President; Martin Bokesch, Treasurer; J. Dallas Nutt, Secretary.

Meeting of November 26

Youngstown Chapter of the Refrigeration Service Engineers' Society of Youngstown met November 26 at 2600 Market St. President Saunders opened the meeting. After the roll-call of officers the minutes of the last meeting were read and the treasurer gave his report.

Several prospective members inquired about the purposes of these meetings and Mr. Ed Wright responded. Then the meeting was thrown open for discussion.

A motion was made by Mr. Bokesch to appoint a membership committee and was seconded by Mr. Burke. President Saunders appointed E. J. McManus, Roy Keith and E. W. Van Cise.

A motion was made and seconded, to appoint an educational committee. The President appointed C. S. Foulke, Ed Wright and J. H. King.

8 to 10:30 was suggested as meeting hours.

Next meeting is to be held Dec. 10, at J. H. King's, 83 Broadway. Each member is to bring a question pertaining to refrigeration service.

✕ ✕ ✕

CLEVELAND CHAPTER

Meeting of November 16

PRESIDENT WARREN FARR called the meeting to order and after dispensing with the reading of the previous minutes he introduced National Secretary H. T. McDermott and stated that the purpose of this meeting was to get full information as to the purposes and objects of the Refrigeration Service Engineers' Society.

After Mr. McDermott's talk several of the members asked questions which were answered, and a resolution was introduced to the effect that the organization of Cleveland service men apply for a charter for a local Cleveland chapter which was seconded and unanimously carried. Following this, a proposed Constitution and By-Laws was suggested and adopted by the members who had signed the petition for a charter.

As a number of supply men were present, President Farr called upon them for remarks and they enthusiastically stated that the organization as it had been outlined will be a most valuable asset to service men. A general discussion took place as to the many activities that Cleveland Chapter would enter into, after which the meeting adjourned.

DETROIT CHAPTER

Meeting of November 21

THE meeting was called to order by President Downs. The Secretary read the minutes of the previous meeting which were accepted as read.

A short discussion followed concerning the proposed Detroit Code, and a definite committee to represent the Society was appointed, and confirmed.

The Entertainment Committee placed their program before the meeting, which was accepted. A dance and ball is to be held Saturday, December 15th, at Schiller Hall, Detroit, Mich., where a good time is planned for all.

J. M. Oberc, Secretary, handed in a written resignation from the position, commenting that it was improper for any supplier of goods to hold an office in the Society for obvious reasons. The resignation was accepted.

Mr. James E. Perry, a refrigeration engineer of no mean reputation, was selected to take over the duties of Secretary, to take effect immediately. There being no further business to be transacted, the meeting was adjourned.

S S S

CONGRATULATIONS, MR. KAP

FRANK W. KAP, secretary of Greater Chicago Chapter since its formation, has deserted the ranks of the bachelors, and we learn will take unto himself a wife on December 15, 1934. Best wishes to Mr. and Mrs. "F. W."

S S S

UTILITIES SALES TO STOCK FEDDERS LINE

MR. MARC SHANTZ, manager of the Chicago branch of the Fedders Manufacturing Co. of Buffalo, New York, has announced, effective immediately, that the Utility Engineering Sales Co., 410 N. Wells St., Chicago, will handle the complete line of their refrigeration appliances and will stock the various items comprising this line in order to facilitate prompt shipment to the service man.

HAPPENINGS AMONG OHIO SERVICE MEN

By the Roving Reporter

YOUNGSTOWN Chapter got off with the bell, beating Cleveland to the punch by one day in the matter of applying for a chapter charter. Twelve applications were paid for at the first meeting and at the second four more were received together with additional ones signed up, all told 22 have placed their name on the dotted line and the $5.00 dues are being garnered in by membership committee which was appointed by temporary president K. T. Saunders and his Kat. (For the benefit of the Ohio chapters this correspondent will explain that Kat is attracted to Kats and at both meetings a Kat has occupied his desk.)

He also appointed an educational committee in order to carry out the plan of procedure suggested by National headquarters.

Cleveland Chapter

President Warren Farr and his right bower, Secretary Ken Wall, held another pow-wow of the Cleveland contingent, laid plans for credit exchange and got a committee working on it. They are going places, these Cleveland boys. So far this correspondent has not been able to dig anything but good reports about them and understands they are strongly in favor of leaving chisels at home. They number about 40 to date, and are going after membership with a vengeance, which applies also to Akron and Youngstown.

A dragnet has been thrown out and all service men are being corralled, enticed, invited and wheedled until they sign up.

This Society represents the greatest opportunity service men ever had to organise themselves, say we in Ohio and confidently believe we will have a State organization soon.

Akron Chapter

Akron, through the efforts of Messrs. Stewart and Kinsinger, has secured the necessary quota for charter application and probably by the time this is printed will have sent it in. The boys say that inasmuch as Akron is a rubber town they will stretch their membership to the limit. *E.W.*

GREETINGS FROM THE NATIONAL PRESIDENT

I APPRECIATE this opportunity of greeting each member of the Society and to thank those who attended and participated in our First Annual Convention, and for the honor conferred upon me in electing me your National President for the ensuing year. I deeply appreciate the confidence you have reposed in me and I am more than pleased with my fellow officers who join me in thanking you and pledging our support for the furtherance of the Society's objectives.

This Society is for the benefit of the refrigeration service man and it is part of our program to secure such information as the individual membership may desire and to place it at their disposal. In doing this we can keep all members abreast of the times, informing them of the latest developments in refrigeration equipment as fast as it is released; to answer their questions and help them with their refrigeration problems. In carrying out the program for the coming year to a successful conclusion, we ask the support of each individual member and that you will personally acquaint other service men of the advantages of membership in this Society whether it be for your Chapter or as a member-at-large. It will be our aim that members of this Society will be identified by their ability to do a proper job of refrigeration servicing—that they will do their work promptly, courteously and honestly.

This Society is young—not yet two years old, and in the short period of its existence it has received wide-spread recognition and its value to each individual member will increase as the knowledge of its purpose and accomplishments become more widely known.

Now, fellow engineers, there is only one way to gain the confidence of the buyers of your service—that is to show them you are competent and worthy. If you do this and do it consistently I know that your reward in increased business will be ample. Never let any manufacturer of refrigerating equipment say that a member of this Society was careless or dishonest in the handling of his machines.

We seek the cooperation of all service men, manufacturers and distributors, and all interested in the advancement of this rapidly growing profession. The National Officers of this Society welcome at all times constructive suggestions in furthering the principles as laid down for our guidance by the Constitution and By-Laws.

This organization has a definite program for the advancement and recognition of those individuals identified in this profession and in attaining this goal it is natural to expect that it will result to the mutual advantage of all interested in the progress of this industry.

Again, I extend greetings to the officers and members of our constituent chapters and to our many members-at-large and to solicit their cooperation in recording a year of real accomplishments.

My Season's Greetings to all.

Cordially yours,

THOMAS J. FOWLER, *National President.*

S S S

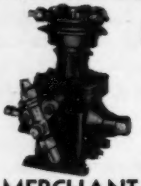
CHICAGO CHAPTER VISITS MILWAUKEE CHAPTER

HEADED by National President Thos. J. Fowler, who is also president of Chicago Chapter, a delegation of over fifteen Chicago members enjoyed an eventful evening on November 20.

This visit was the result of an invitation extended by Milwaukee Chapter and primarily for the purpose of the membership of the two chapters getting better acquainted. President Wang of Milwaukee Chapter in his usually efficient manner announced that the business of the evening would be entirely dispensed with and that formalities would be forgotten for the purpose of the better acquaintanceship of each chapter.

President Wang then introduced National President Fowler, who responded with a brief address and the introduction of other Chicago officers who attended. A delightful buffet lunch was served at the close of the meeting and it was the consensus of opinion that meetings of this nature should be carried on indefinitely.

BARE COMPRESSORS
FOR
REPLACEMENT



Complete Compressors
For New Installation
Up to 10 H. P.

Data Sheets on Request
MERCHANT & EVANS CO., Mfrs.
Main Offices PHILADELPHIA, PA.
Plant LANCASTER, PA

WHOLESALE
Refrigeration Supplies

Sulphur and Methyl	20c and 60c
Carbon Tetrachloride, per gal.	$1.60
All White Oil, per gal.	1.60
Semi-White Oil, per gal.	.90
Automatic Pressure Water Valves	6.00
Penn Cold Controls, *see below*	3.95
Penn Low-side Controls	6.00
Thermo. Exp. Valves	7.50
Automatic Exp. Valves	$3.50 & 4.50

Special

Turn your losses on repaired controls into profits and end your free service calls on controls by installing NEW Penn Controls, specially designed to fit Copelands and nearly all other household units. Price $3.95.

QUANTITY PRICES ON REQUEST

Also complete stock of Imperial Brass Flare and Sweat Fittings, Valves, Tools and Gauges, Copper Tubing, Motor Brushes and Bearings, Gates Belts, and Compressor Gaskets. All at lowest market price, f.o.b. Chicago.

CARL JOHN STEIN COMPANY
Est. 1890
122 West Illinois St., Chicago

CINCINNATI BRANCH MOVES

REMOVAL of the Fedders Cincinnati Branch to its new and larger headquarters at 303 East Sixth St., is announced by the Fedders Manufacturing Co., of Buffalo, N. Y.

The Cincinnati Branch is under the direction of Frank Haag, Branch Manager. A large stock of Fedder standard refrigeration appliances is warehoused for immediate delivery to the trade throughout the territory served out of Cincinnati.

SUGGESTIONS WANTED

OFTENTIMES readers may come across methods of accomplishing certain results that would be of benefit to other readers if this information were available.

Has any reader a suggestion on "How to remove spots from porcelain interiors of refrigerators"? It has been further suggested that probably solutions or compounds in packages for resale are obtainable and the service man would be in a position to either recommend or sell this to the housewife who makes the inquiry rather frequently.

This would sometimes obviate the necessity of the service man doing such a job which might not prove as profitable as being able to recommend or sell some prepared compound.

The Electric Refrigeration Service, Inc., has been chartered at 137 Fifth Ave., North, Seattle, Wash., with a capital of $2,500, by Joseph E. Rucker, Joseph Parutto and Bessie J. Knettle.

The Western Refrigerator Service has engaged in business at 10329 Missouri Ave., Los Angeles, Cal., under management of J. B. Phelps.

WITH
SCIENTIFIC ACCURACY
THE TURNER HALIDE DETECTOR
will instantly locate the slightest leak of *any* chlorinated hydrocarbon refrigerant.
It is indispensable in making field tests and on installation and service work. Easy to carry, simple to operate and positive in results. Used and indorsed by leading refrigerator manufacturers. *Send today for catalog and prices.*
THE TURNER BRASS WORKS
DEPT. S12 SYCAMORE, ILLINOIS

Herkimer Institute

"Makers of All-Make Service Men"

1819 Broadway New York City

"A Practical Trade School"

New models and new refrigerants do not up-set service departments manned by "Herkimer trained" service mechanics. Competent men available for all localities. Dealers, Service Managers, Manufacturers, when in need of reliable service men—

Write, phone or wire— no obligations.

Karlberg Replacement Seal for Servel Compressors

A new improved complete bearing plate and seal, replacing the seal now on the standard Servel compressor, particularly the old graphite type seal.

Write for prices and complete information.

TRICO COMPRESSOR SERVICE

42 N. Paulina St., Chicago

Service Men

SELL PINCHOFF PROTECTORS TO YOUR CUSTOMERS

Thousands now in use.

A device that can be quickly installed over new or old pinchoffs by merely tightening two bolts. It will prevent liquid line breakage from vibration, bending, or careless handling. Cadmium plated. List price 15c. Ask your local supply house, or mail card for sample and discounts.

UNITED MFG. CO.

9678 W. Pico Blvd., Los Angeles, Calif.

SUPPLIES—PARTS—COILS—CHEMICALS—MATERIALS—UNITS

REFRIGERATION SPECIALTIES

"With Estimating Service for Service Engineers"

SERVICEMEN SUPPLY CO.

1819 Broadway, NEW YORK CITY

WRITE FOR NEW PRICE LIST

Rempe Fin Coil Co.

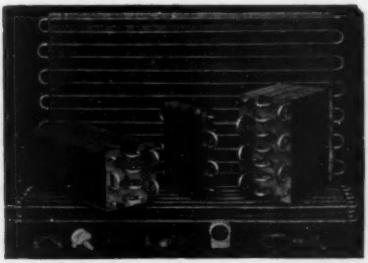
340 N. Sacramento Blvd.

CHICAGO, ILL.

Phone: Kedzie 0483

ALUMINUM, COPPER, AND GALVANIZED SEAMLESS STEEL FIN COILS

Send for our new price list and discount sheets



Write for Advance 1935 Information

STARR FREEZE

1/8 to 10-hp. COMPRESSORS
CONDENSING UNITS
DOMESTIC REFRIGERATORS
COMMERCIAL REFRIGERATORS
AIR COOLERS
REFRIGERATION SERVICE SUPPLIES

THE STARR COMPANY

Richmond, Indiana (Factory)

222 North Vermont Avenue, Los Angeles, Calif.

Want *Information*?

Use The R. S. E. SERVICE DEPARTMENT

—It's for Your Convenience

THIS department is conducted for the convenience of our subscribers. We will ask the manufacturers and distributors to send you the latest information on the items checked.

- ☐ Belts
- ☐ Blow Torches
- Blowers (see Unit Blowers)
- ☐ Books
- ☐ Brushes, Motor
- ☐ Bushings, Motor
- ☐ Carbon Tetrachloride
- ☐ Charging Hose
- ☐ Charging Stand

- Coils
  - ☐ Fin
  - ☐ Pipe
- ☐ Compressors
- Condensers
  - ☐ Air Cooled
  - ☐ Water Cooled
- ☐ Condenser Water Regulators
- ☐ Connecting Rods
- Controls
  - ☐ Cold
  - ☐ Humidity
  - ☐ Liquid Level
  - ☐ Pressure
  - ☐ Temperature
  - ☐ Thermostatic
  - ☐ Water
- ☐ Domestic Evaporators
- Dehydrants
  - ☐ Activated Alumina
  - ☐ Calcium Chloride
- ☐ Dehydrators
- Door Seals (see Gaskets)
- ☐ Drums, Service
- ☐ Dryers

- Evaporators
  - ☐ Dry
  - ☐ Flooded
- ☐ Fan and Pulley Assemblies
- Filters (see Strainers)
- ☐ Float, High Side
- ☐ Float Valve Seats
- Fittings
  - ☐ Flared
  - ☐ Streamline
- Gaskets
  - ☐ Compressor
  - ☐ Door
- ☐ Gasket Material
- ☐ Gasket Tackers
- ☐ Goggles
- ☐ Gauges, Service
- ☐ Hardware, Refrigerator
- ☐ Leak Detectors
- ☐ Lapping Compound and Materials
- ☐ Liquid Indicator
- ☐ Lubricating Oils
- ☐ Low Side Float Switches
- ☐ Low water
- ☐ Motors
- ☐ Needles, Float Valve
- ☐ Oil Return
- Packing
  - ☐ Fabric
  - ☐ Metallic
- ☐ Piston Pins
- ☐ Piston Rings
- ☐ Porcelain Refrigerator Cement
- ☐ Pumps, Circulating
- ☐ Receivers
- Recording Instruments
  - ☐ Humidity
  - ☐ Running Time
  - ☐ Temperature
- Refrigerants
  - ☐ Sulphur Dioxide
  - ☐ Methyl Chloride
  - ☐ Carrene
  - ☐ Freon
  - ☐ Iso Butane
  - ☐ Ethyl Chloride
- Refrigerator Dishes
  - ☐ Glass
  - ☐ Porcelain
- ☐ Safety Masks

- ☐ Seals, Shaft
- ☐ Resurfacing Stones
- Strainers
  - ☐ Expansion and Float Valve
  - ☐ Liquid Line
  - ☐ Suction Line
- Switches
  - ☐ Air Temperature
  - ☐ High Pressure Control
  - ☐ Low Pressure Control
  - ☐ Pressure
  - ☐ Temperature
- ☐ Mercury
- Thermostats
  - ☐ Air Temperature (Cooling)
  - ☐ Air Temperature (Heating)
  - ☐ Brine
  - ☐ Domestic Refrigeration
  - ☐ Industrial Refrigeration
- Thermometers
  - ☐ Refrigerator
  - ☐ Test
- ☐ Tool Chests
- Tools
  - ☐ Flaring
  - ☐ Pinchoff
  - ☐ Tube Bender
  - ☐ Tube Cutter
  - ☐ Wrench Sets
- ☐ Trap, Scale
- ☐ Trays, Ice Cube
- Tubing
  - ☐ Copper
  - ☐ Finned
  - ☐ Steel
  - ☐ Tinned
- ☐ Unit Blowers
- Valves
  - ☐ Automatic Expansion
  - ☐ By Pass
  - ☐ Check
  - ☐ Compressor
  - ☐ Expansion
  - ☐ Flapper
  - ☐ Magnetic
  - ☐ Pressure Reducing
  - ☐ Shutoff
  - ☐ Solenoid
  - ☐ Thermostatic Expansion
  - ☐ Two-Temperature
  - ☐ Water
- ☐ Valve Retainers
- ☐ Valve Stems

Write in Names of Products Not Listed

Name .....

Address .....

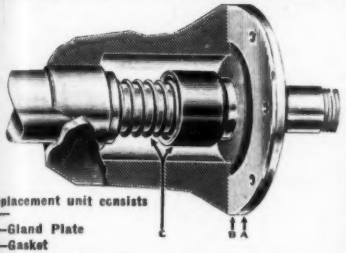
City and State .....

Business .....

Mail This Page to the

Refrigeration Service Engineer 433 N. Waller Ave., Chicago, Ill.

SAVE - - MONEY TIME AND TROUBLE



Replacement unit consists of—
A—Gland Plate
B—Gasket
C—Rotary Seal Assembly

The Rotary Seal replacement unit prevents loss of refrigerant, eliminates seal squeaks and stops unnecessary friction. These units can be supplied for most of the popular makes of refrigerators. If your jobber cannot supply you, then write to us for descriptive circular and list of the new lower prices.

ROTARY SEAL CO.

809 W. MADISON ST.. CHICAGO

A BULLETIN OF INTEREST TO YOU!

... A reprint from Industrial and Engineering Chemistry entitled "Sulfur Dioxide as a Refrigerant," containing facts for every Service Man. Free at your request.

Extra Dry ESOTOO (Liquid Sulphur Dioxide) is prepared expressly for refrigeration purposes. Clean, pure, efficient, dependable.

V-METH-L (Virginia Methyl Chloride) is now available from warehouse stocks in nearby points. Write for descriptive folder now.

VIRGINIA SMELTING Company
WEST NORFOLK, VIRGINIA

F. A. EUSTIS, SEC.
131 State St., Boston, and
76 Beaver St., New York

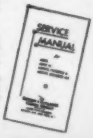
DU PONT
REG. U. S. PAT. OFF.

Artic
REG. U. S. PAT. OFF.
(DU PONT METHYL CHLORIDE)

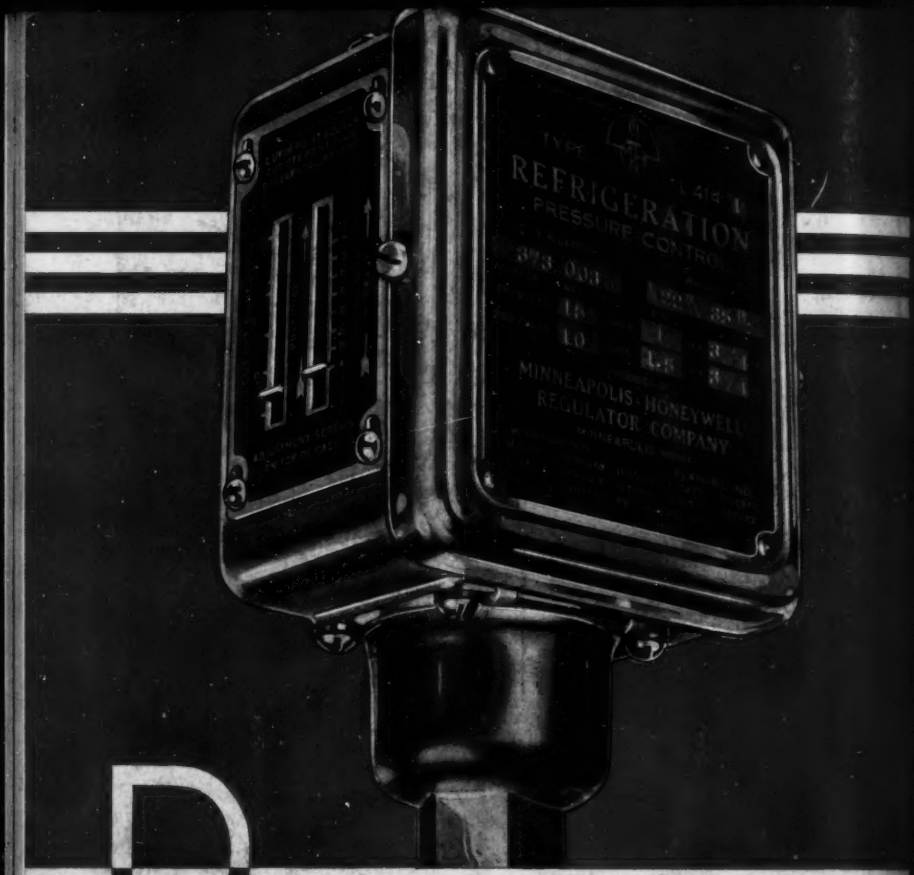
Strict production control and analytical tests on ARTIC before shipping assure you of receiving a product *always* low in moisture and acidity, high in purity.

Adequate stocks of ARTIC are carried by distributors strategically located throughout the country, assuring prompt filling of orders. An ARTIC distributor is located near you.

Our experience of many years in manufacturing and handling ARTIC is summarized in a booklet for service men containing information on handling, servicing, testing for leaks, and other items of interest. Send for your free copy.



R&H Chemicals
THE R. & H. CHEMICALS DEPT.
E. I. DU PONT DE NEMOURS & COMPANY, INC.
Wilmington, Delaware
District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco



REFRIGERATION IS ONLY AS GOOD AS ITS CONTROLS

PROPER automatic control is necessary for efficient operation of refrigerating equipment. To insure long, trouble-free performance, use Minneapolis-Honeywell refrigeration controls. Visible scales, locking and leveling devices, wide range, accuracy, small or large operating differential—all at no extra cost—simplify installation and service . . . Minneapolis-Honeywell Refrigeration Controls are available in all desired temperature and pressure ranges, and are suitable for all types of commercial installations or air conditioning applications . . . Minneapolis-Honeywell Regulator Company, 2934 Fourth Avenue So., Minneapolis, Minnesota. Branch and distributing offices in all principal cities.

MINNEAPOLIS-HONEYWELL

Control Systems

QUALITY CONTROLS COST LESS THAN